PATENT SPECIFICATION 1,182,908

DRAWINGS ATTACHED.

1,182,908

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COMPLETE SPECIFICATION.

A Hose Pump.

We, POLYMETRON A.G., a Swiss Company of Flughofstrasse 39, Glattbrugg, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a hose pump comprising a plurality of plungers arranged one behind the other which are actuated by a common eccentric shaft.

The function of hose pumps is to keep a liquid accommodated in a hose moving forwards by progressively pinching or compressing the hose in the pumping direction. For this purpose, they may comprise a plurality of plungers which are moved periodically up and down from an eccentric shaft.

Conventional designs include an eccentric shaft in which the progressive motion of the plungers is controlled by an eccentric arrangement. At their upper ends, the plungers carry small ball bearings whose outer rings ride on the shaft. For reasons of easier manufacture, the eccentrics are milled, for example, from nylon and are mounted on a steel shaft. However, the considerable force required to produce an adequate pumping action has a twofold effect. Firstly the eccentrics are quickly worn despite the rolling friction with respect to the ball bearings, and secondly the eccentric shaft as a whole, built up in this way, does not have enough stiffness in flexure to withstand elastic deformation by the forces generated by the plungers, with the result that the requisite compressive forces are never obtained.

Another solution is described in Patent Specification No. 923,443 in which the plungers consist of a number of adjacent plates with an opening in the middle of each. A camshaft extends through the openings in the plates, its function being to control the reciprocating movement of the plates. This solution also has various disadvantages, including the considerable friction that occurs between the surface of the plates and their guides. Another disadvantage is that the cams which ride in the openings do not exert the compressive forces along the line of symmetry of the plates with the result that the plates become distorted in their guides, thereby causing additional friction. A third disadvantage is that in this case, too, the camshaft does not have the necessary stiffness in flexure because there are limits to its diameter.

The present invention provides a hose pump comprising a plurality of plungers arranged one beside the other which are sequentially actuated by a common shaft, wherein, for actuating each plunger, the shaft is fitted with ball bearings whose inner rings are pressed on to discs mounted eccentrically relative to the axis of rotation of the shaft, whilst each of their outer rings rests on a pressure plate fixed to the plunger associated with it.

An embodiment of the invention is described by way of example with reference to the accompanying drawings, wherein:

Figure 1 is a longitudinal section, and

Figure 2 is a cross-section on the line I—I of Figure 1 through a hose pump according to the invention.

To make the drawings clearer, the strokes of the plungers have been shown longer than they are in practice.

Accommodated in a U-shaped housing 1 with side walls 2 is a hose bed 3 on which hoses 4 which are to be subjected to the pumping operation are placed. A plurality of plungers 7 with shafts 8 are mounted for displacement in guide plates 5, 6 anchored between the side walls 2. Each shaft 8 terminates at its upper end in a pressure plate 9. In this example, compression springs 10 are

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anchored between the guide plate 5 and each pressure plate 9, forcing the plungers upwards.

Mounted in the side walls 2 is a shaft 11 which is made sufficiently strong and stiff in flexure to withstand the forces acting upon it. Mounted on this shaft is a number of discs 12 corresponding to the number n of plungers. The discs 12 are provided with an eccentric bore adapted to the diameter of the shaft 11 and are keyed to the shaft in such a way as not to rotate. The extent to which each bore is eccentric is governed by the stroke to be made by the plungers 7. The discs 12 are each offset by at least $360/n$ degrees in regard to their eccentricity, resulting in a continuous pumping action. The number of plungers should be large enough so that the contents of the hose can be moved progressively forwards in the pumping direction rather than being pushed back and forth between two adjacent plungers. As a rule, an embodiment with 6 plungers and 6 eccentric discs each offset by 60° constitutes the minimum. In the embodiment shown in Figure 1 there are seven plungers of which the two end ones are fixed in the same position in regard to their eccentricity. The angular distance between the individual discs amounts to $360/n-1$ degrees.

Arranged around the discs 12 are ball bearings 13 whose outer rings 14 rest on the pressure plates 9 of the plungers.

It would of course also be possible to provide more than seven plungers, in which case the angular interval between each eccentric disc would become correspondingly smaller, or alternatively with fairly large angular intervals the pattern of the eccentric discs would be repeated.

The advantage of the hose pump according to the invention is that, except for the shaft 11 which must be sufficiently stiff those components that are involved in the movement of the plungers do not necessitate any particular measures with a view to reducing wear. The compressive forces are absorbed solely by the ball bearings which, in so doing, are only performing the function for which they are intended. The only movement that occurs between the outer ring 14 and the pressure plate 9 is a rolling movement, providing the friction between these surfaces is greater than the frictional resistance of the ball bearing. However, the pressure plate 9 is not placed under excessive strain by this rolling movement.

WHAT WE CLAIM IS:—

1. A hose pump comprising a plurality of plungers arranged one beside the other which are sequentially actuated by a common shaft, wherein, for actuating each plunger, the shaft is fitted with ball bearings whose inner rings are pressed on to discs mounted eccentrically relative to the axis of rotation of the shaft, whilst each of their outer rings rests on a pressure plate fixed to the plunger associated with it.

2. A hose pump as claimed in claim 1, wherein the plungers are pressed against the outer rings of the ball bearings by forces exerted by springs.

3. A hose pump as claimed in either preceding claim, wherein the eccentrically mounted discs are progressively offset relative to one another by at least $360/n$ degrees, where n is the number of plungers by which they are actuated.

4. A hose pump as claimed in any one of the preceding claims, in which n is at least 6.

5. A hose pump as claimed in any one of the preceding claims in which the friction between the outer rings of the ball bearings and the pressure plates is greater than the frictional resistance of the ball bearings.

6. A hose pump substantially as herein described with reference to the accompanying drawings.

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1 SHEET This drawing is a reproduction of the Original on a reduced scale

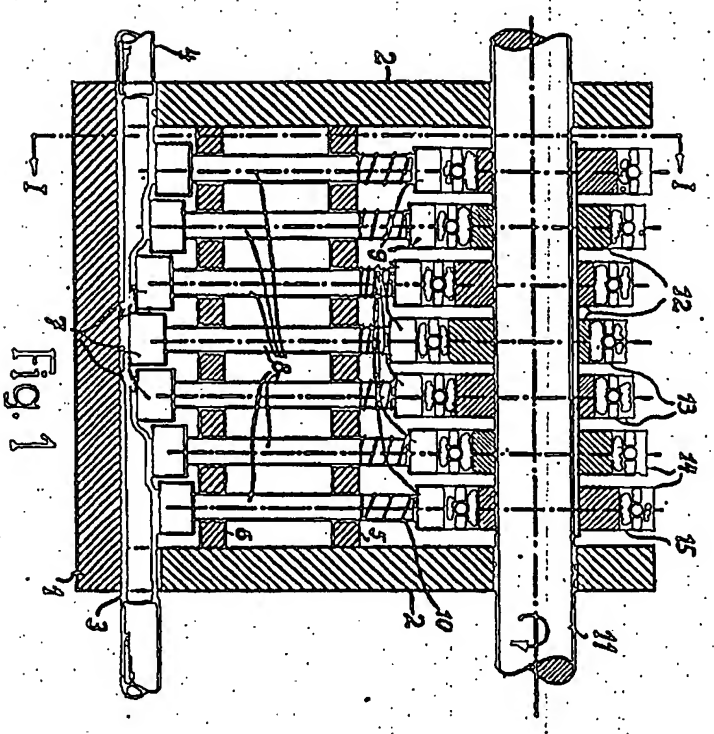

Fig. 1

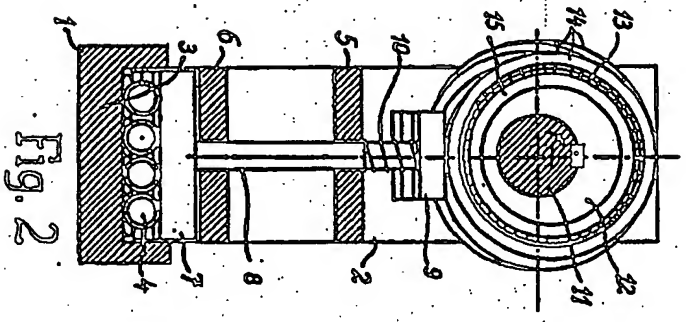

Fig. 2